QUALITY ASSURANCE PROJECT PLAN

FOR SAMPLING
SUSPENDED SEDIMENT CONCENTRATIONS
IN THE 31 IMPERIAL VALLEY DRAINS
FLOWING INTO THE SALTON SEA

March 2002

Prepared by and for
California Regional Water Quality Control Board Staff
Colorado River Basin Region

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Quality Assurance Project Plan

for Sampling Suspended Sediment Concentrations
in the 31 Imperial Valley Drains Flowing into the Salton Sea

APPROVALS:

California Regional Water Quality Control Board

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Doug Wylie, P.E., Senior WRC Engineer Project Manager	Date
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Joan Stormo, Senior Engineering Geologist Basin Planning Unit Chief	Date
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1. PROJECT MANAGEMENT

1.1 INTRODUCTION

This Quality Assurance Project Plan (QAPP) describes the monitoring activities to characterize the suspended sediment concentrations in the 31 Imperial Valley Drains flowing directly into the Salton Sea, and the quality assurance (QA) and quality control (QC) procedures associated with these monitoring activities. This QAPP follows the format that the United States Environmental Protection Agency (USEPA) has established in its *Requirements for Quality Assurance Project Plans, EPA QA/R-5, 2001.* Further, it also complies with the QA/QC requirements specified in the *State Water Resources Control Board Quality Assurance Program Plan, 1994*.

The Quality Assurance Officer is responsible for ensuring that the QAPP commitments are implemented and followed to meet the objectives of this project. The Quality Assurance Officer will be independent from the monitoring crew generating the data for this project and has authority to change and modify this QAPP to achieve the objectives of the project.

1.2 DISTRIBUTION LIST

The following individuals will receive copies of the approved QAPP and subsequent revisions:

- Jose Angel, P.E., Division Chief*
- Doug Wylie, P.E., Project Manager*
- Joan Stormo, Senior Engineering Geologist*
- Maria de la Paz Carpio-Obeso, Ph.D., Quality Assurance Officer*
- Jeff Allred, WRCE, Field Lead Person
- Phan Le, WRCE, Field Sampler
- Jose Cortez, WRCE, Field Sampler

Also, copies of the approved QAPP and subsequent revisions will be placed in the following RWQCB files:

- TMDL QAQC (TMDL Section Quality Assurance File)
- TMDL SILT IVD (TMDL Silt Imperial Valley Drains)

* indicates approving authority

1.3 PROJECT/TASK ORGANIZATION

Specific Project responsibilities of the Regional Board staff are outlined below. A project organization chart is provided as Attachment 1.

Jose Angel, Project Supervisor, Supervising WRC Engineer, 760-776-8932

- Review and approve the QAPP and subsequent revisions.
- The primary decision maker, responsible for oversight of the project at Regional Board level.

Doug Wylie, Project Manager, Senior WRC Engineer, 760-346-6585

- Review and approve the QAPP and subsequent revisions.
- Ensure that the QAPP is implemented and followed to meet the project objectives.
- Review reports and ensure plans are implemented according to schedule.
- Conduct Health and Safety briefing for sampling team prior to each sampling event.
- Coordinate field and laboratory activities.

- Conduct project activities in accordance with the QAPP.
- Report to the Quality Assurance Officer and management regarding the project status. Prepare interim and final reports for the Quality Assurance Officer and management.

Joan Stormo, Senior Engineering Geologist, Basin Planning Unit Chief, 760-776-8982
- Review and approve the QAPP and subsequent revisions.
- Ensure that the QAPP is implemented and followed to meet the project objectives.

Maria de la Paz Carpio-Obeso, Quality Assurance Officer, Environmental Scientist, 760-674-0803
- Review and approve the QAPP and subsequent revisions.
- Ensure that the QAPP is implemented and followed to meet the project objectives.
- Review reports and ensure plans are implemented according to schedule.
- Responsible for operation of the Regional Board Laboratory.
- Responsible for coordinating lab quality assurance activities.

Jeff Allred, Field Lead Person, WRC Engineer, 760-776-8946
- Responsible for maintaining and calibrating instruments in the field.
- Responsible for coordinating filed activities and ensuring they are consistent with QAPP.
- Assist with monitoring activities as required.
- Prepare a narrative report on sampling event.
- Responsible for delivery of samples to the laboratory.
- Responsible for decontamination of sampling equipment used in field.

Nadim Zeywar, Field Sampler, Environmental Scientist, 760-776-8971
- Assist with monitoring activities as required.

Jason Voskanian, Field Sampler, SETT, 760-776-8930
- Assist with sampling activities as required.
- Responsible for delivery of samples to the laboratory.

Phan Le, WRC Engineer, 760-346-7491
- Assist with sampling activities as required.
- Responsible for calibration of metering equipment prior to sampling event.
- Responsible for assisting Lab Director with water quality analysis.

Jon Rokke, Field Sampler, WRCE, 760-776-8959.
- Assist with sampling activities as required.
- Responsible for delivery of samples to the laboratory.

Kola Olatunbosun, Field Sampler, WRCE, 760-776-8986
- Assist with sampling activities as required.
- Responsible for delivery of samples to the laboratory.

Theresa Illare, Field Sampler, Environmental Scientist, 760-776-8971
- Assist with sampling activities as required.
- Responsible for delivery of samples to the laboratory.

Maribel Rodriguez, Field Sampler, SETT, 760-776-8971
- Assist with sampling activities as required.

Jose Cortez, Field Sampler, WRC Engineer, 760-674-8142
- Prepare the Quality Assurance Project Plan (QAPP) and revisions.
- Responsible for processing data, maintaining the project database, and validating the field data.

- Assist with sampling activities as required.

1.4 PROBLEM DEFINITION/BACKGROUND

Pursuant to Section 303(d) of the Clean Water Act (CWA), the Colorado River Basin Regional Water Quality Control Board (Regional Board) is developing Siltation/Sedimentation Total Maximum Daily Loads (TMDLs) for the Imperial Valley Drains that discharge directly into the Salton Sea. The TMDLs are being developed because the list of impaired waterbodies for the Region (also known as the Region's 303(d) list) identifies the Drains as water quality limited, in part, because sediment concentrations violate the water quality standards (WQS) established by the Regional Board to protect the beneficial uses of the Drains. TMDL development requires a Source Analysis that identifies the sources of the pollutant of concern and quantifies their relative contributions. The data collection activities outlined in this QAPP are being undertaken to better characterize the sources of sediment to the Drains, and the existing sediment concentrations within them.

The Imperial Valley Drains (Drains) discharging directly into the Salton Sea are generally located around the southern perimeter of the Salton Sea The Drains are dominated by agricultural return flows from Imperial Valley. These agricultural return flows consist of surface run-off (tailwater) and subsurface drainage (tilewater), which mix with groundwater seepage. The Drains are operated by the Imperial Irrigation District (IID). Tailwater is believed to be the main source of sediment, and sediment is present in the Drains at concentrations that violate the WQS the Regional Board has established for surface waters within the watershed. Other sources and activities that contribute to the current sediment load of the Drains include dredging of the Drains, channel scouring in areas of high velocity flow, and, to a lesser degree, stormwater runoff and wind deposition. The Drains discharge a combined average flow of about 100 cfs (75,000 AFY) into the Salton Sea.

1.5 PROJECT/TASK DESCRIPTION

The overall objective of this project is to obtain valid data of known and documented quality, which can be utilized in the Source Analysis of the Imperial Valley Drains Sediment TMDLs, and in determining "baseline" sediment concentrations, from which future changes in sediment concentrations can be evaluated. Specific objectives targeted towards meeting this overall objective are to:

1. Collect representative water samples for total suspended solids (TSS) and turbidity analyses from the Drains at the sampling locations identified in Table No. 2, below;

2. Conduct field measurements of dissolved oxygen (DO), pH, temperature, turbidity, and electrical conductivity (EC) conditions in the Drains;

3. Evaluate the water quality data acquired through this Project and compare them with existing Regional Board data and data collected by IID through its Drain Quality Improvement Program;

4. Collect representative TSS and turbidity data for use, to the degree feasible, in developing an empirical relationship between TSS and turbidity for water in the IV Drains;

The initial phase of this Project consists of twelve monthly sampling events. The first event is scheduled for March, 2002. During the events, water samples will be collected and field measurements taken at the thirty-one (31) drains, which have been identified as discharging directly into the Salton Sea. Future phases of this project may be undertaken, depending on data needs, as well as staff and funding availability, based on future revisions of this QAPP. The specific sampling locations are described in detail in Section 2.1.

1.6 DATA QUALITY OBJECTIVES AND CRITERIA

Valid data of known and documented quality is needed to meet the objectives of this project. Therefore, for the critical measurements of this project (TSS and turbidity), only data for which the data quality indicators show that the data quality objectives are being met will be considered valid. The specific data quality objectives of this project are:

- The analyses for TSS and turbidity must yield results that are of sufficient quality to be used in the development of the source analysis for the sediment TMDLs. Therefore, data obtained should be of sufficient quality to be utilized to determine the relative contributions of sediment from the Drains at the time of sampling.

- The analyses for TSS and turbidity must yield results that are of sufficient quality to be utilized, along with data from future sampling projects, in the determination of representative "baseline" suspended sediment concentrations in the Drains. Therefore, data collected must be of sufficient quality to determine the relative changes in suspended sediment concentrations in Drains over time, as land use practices and/or hydrological and/or climate conditions change.

- The analyses for TSS and turbidity will be compared to historic TSS and turbidity data for the Drains to assess the overall representativeness of the historic data for the present situation. Therefore, the detection limits that are proposed herein are, at a minimum, equal to the detection limits for TSS and turbidity used in the historic data.

- The data collected in this project should be of sufficient quality to be utilized to the extent technically feasible, along with data from future sampling projects, in the determination of a TSS/Turbidity relationship for the Drains emptying into the Salton Sea.

1.6.1 DATA QUALITY INDICATORS (ACCEPTANCE CRITERIA)

The following data quality indicators will be utilized to assess whether data generated is useable and meets the data quality objectives stated above:

1.6.1.1 Precision

Precision of the data generated will be assessed as the relative percent difference (RPD) for field duplicates and laboratory dilutions for the samples. The frequency for the field duplicates is discussed in section 2.5, below. All duplicates and dilutions should fall within a 25% RPD for TSS and a 35% RPD for turbidity, as described in Table 1, below in order for the data quality objectives to be met.

1.6.1.2 Accuracy

Accuracy will be determined using double blind spike samples for turbidity and TSS, field blanks, and equipment blanks. The frequency for the submittal of double blind spikes, field blanks, and equipment blanks is discussed in Section 2.5, below. For double blind spikes, the laboratory results for both TSS and turbidity should be between 80 and 120 percent recovery of the true concentration of the spike, as described in Table 1, below, in order for data quality objectives to be met.

For field blanks and trip blanks, the average of all TSS measurement must be 15 mg/l or less, and the average of all turbidity measurements must be 15 NTU or less, in order to for this data quality objective to be met.

1.6.1.3 Completeness

To ensure completeness, 80 percent of the samples proposed in the design must be collected and analyzed. If less than this amount of samples is collected and analyzed, another sampling event will be required.

1.6.1.4 Comparability

Comparability will be addressed by using commonly accepted sampling and analytical techniques and by reporting data in commonly accepted units.

1.6.1.5 Representativeness

Representativeness will be assured by using a statistically significant number of samples with only one event and sampling at specific locations where a representative sample can be obtained, i.e. where flows are relatively well mixed and at least 100 feet downstream from the influence of potential sources of bias, such as direct tailwater discharges to the Drain being sampled.

Table No. 1, below, summarizes the precision, accuracy and completeness criteria.

Table 1: QA Objectives for Laboratory Data

Parameter	Matrix	Units	Precision (RPD)	Accuracy (% Recovery)	Completeness[1] (% Cmp)
TSS	Water	mg/L	25	80-120	80
Turbidity	Water	NTU	35	65-135	80

[1] Completeness criteria will not be applied to results from QC samples.

Where:

RPD = Relative Percent Difference = $\{ABS (D_1 - D_2)/[(D_1+D_2)/2]\}x100$

D_1 = Results for sample 1

D_2 = Results for sample 2

ABS = Absolute value

% Recovery = Recovery of spike samples = S_s/S_e

S_s = Result of spiked sample analysis

S_e = Expected result of the spike sample analysis

$\%C_{mp} = 100x(V/n)$

V = Number of valid samples

n = Number of samples collected

1.7 SPECIAL TRAINING REQUIREMENTS/CERTIFICATION

The Project Manager will ensure that all of the field samplers have valid and current training for their field activities, as required by OSHA regulations. Currently, all sampling personnel identified in the Project/Task Organization section of this QAPP have completed the required OSHA training for the sampling activities described herein. There are no other specialized training/certification requirements needed to perform the Project's objectives.

1.8 DOCUMENTATION AND RECORDS

The Project Manager will establish and maintain a Project file for the purpose of filing and safeguarding sampling event data/records in accordance with the QAPP. The Field Lead Person, Quality Assurance Officer, and Unit Chiefs will ensure that all project data they receive/generate about the sampling events (e.g., field notes, chain of custody forms, lab analyses) is delivered to the Project Manager. The Project file shall be available for the review and inspection of the Quality Assurance Officer and accessible to the TMDL Development Unit Chief for TMDL development. The file will contain, but needs not be limited to, the following records:

- field logs/notes, quality control logs and calibration logs
- laboratory analytical reports
- preliminary data reports summarizing field activity and quality control for each sampling event
- data spreadsheets and databases
- miscellaneous correspondence related to the sampling events
- audit reports
- copies of the historic data (e.g., IID data) to be used for comparison purposes
- final report.

Field notes will be entered into bound field log notebooks with pre-numbered pages. Each page of the field logs and field data worksheets will be dated and signed by a member of the sampling team at each sampling station. At the time of sampling, the following information will be entered into the field log book:

- Observations about the weather and the sampling station.
- The latitude and longitude of the sampling station, as determined using a global positioning system (GPS) receiver.
- Identification codes, specific sampling point locations, and sampling methods for all samples taken. The instream YSI readings for temperature, DO, pH and EC.
- Sample codes and time and location of preparation for all quality control samples prepared in the field.
- Any deviations from the procedures of this QAPP.
- Any other noteworthy observations.

Quality control (QC) samples will be documented in a bound Quality Control Log with pre-numbered pages. The Quality Control Log will document the QC samples submitted to the laboratory and the results of the analysis of these QC samples. For each QC sample, the log will contain:

- The sample identification code.
- The supplier of the QC sample.
- The value reported by the supplier.
- The date of preparation and submission.
- The name and signature of the person submitting the QC sample.
- The laboratory performing the analysis.
- The analysis method.
- The reported value from the laboratory.

A YSI 6600 multiprobe water quality sonde will be used for field measurements of DO, pH, temperature, turbidity, and EC. Calibration of the YSI 6600 sonde will be documented in a bound calibration log with pre-numbered pages. The calibration log will contain:

- The date and time of calibration.
- The persons performing the calibration.
- The signature of one of the persons performing the calibration.

- All standard solutions used in calibration, including the source and date of preparation of the standard solution.
- The initial reading of the YSI when tested against each standard solution, and the temperature of each standard solution at the time of calibration.
- Any deviations from the QAPP
- Any difficulties or other relevant notes about the calibration.

Upon completion of the laboratory analysis of the samples from each sampling event, the laboratory will prepare and submit to the Project Manager a Laboratory Analytical Summary. The summary shall consist of analytical results and chain of custody forms.

A Preliminary Monthly Data Report will be produced by the Project Manager and filed with the Quality Assurance Officer within 7 to 10 days from the date the Project Manager receives all lab results for the monthly sampling event. This report will summarize the field activities and observations for the month; it will also include field measurements and the results of the laboratory analysis. This report will also include a quantitative analysis and discussion of the results of quality control activities, and what these results indicate about the quality of data generated in each sampling event. It may include recommendations for modification of this QAPP as appropriate.

The field logs, quality control log, and calibration log along with all additional documentation consisting of any laboratory records, and chain of custody forms will be stored in an organized manner by the Project Manager, and will be available upon request.

Once all of the sampling is completed for this project, a narrative report will be prepared by Project Manager for the Quality Assurance Officer and management. At a minimum, this report will discuss all the field activities, provide a qualitative and quantitative analysis of the data generated by the sampling activities, and any problems encountered and their solutions. Additionally, it will discuss any deviations from this QAPP, if any, as well as a discussion of the data quality.

2. DATA GENERATION AND ACQUISITON

2.1 SAMPLING PROCESS DESIGN

In order to meet the overall objectives stated in section 1.5 of this QAPP, this project was designed to estimate the suspended sediment concentration, as represented by total suspended solids (TSS) and turbidity, at the sampling stations in the IV Drains, and the contributions of suspended sediment to the Drains. Because accurate suspended sediment data is necessary for TMDL development, TSS and turbidity are considered critical measurements for this project, while the other baseline parameters to be measured, temperature, EC, pH and DO, are considered non-critical measurements. The sampling stations were selected to characterize the contribution of suspended sediments from Drains discharging driectly into the the Salton Sea. One sampling station has been establsihed for each Drain.

At each of the locations listed in Table 2, below, between one and four water samples will be taken (i.e. grab, grab duplicate, field spike, or field blank) and a YSI 6600 multi-parameter sonde will be used to take in-stream measurements of temperature, DO, EC and pH.

Table 2: Monitoring Stations

Sampling Location	Description[1]
ND1	Monitoring station for Niland Drain 1.
ND2	Monitoring station for Niland Drain 2.
ND3	Monitoring station for Niland Drain 3.
ND4	Monitoring station for Niland Drain 4.
ND5	Monitoring station for Niland Drain 5.
ZD	Monitoring station for Z Drain.
WD	Monitoring station for W Drain.
UD	Monitoring station for U Drain.
TD	Monitoring station T Drain.
SD	Monitoring station for S Drain.

[1] Located approximately 100 feet upstream of the outlet to the Salton Sea, unless the prescribed distance is inaccessible, as documented by field observations.

RD	Monitoring station for R Drain.
QD	Monitoring station for Q Drain.
PD	Monitoring station for P Drain.
OD	Monitoring station O Drain.
VD3	Monitoring station for Vail 3 Drain.
PUMD	Monitoring station for Pumice Drain.
VD5	Monitoring station for Vail 5 Drain.
VD5A	Monitoring station Vail 5A Drain.
VD6	Monitoring station for Vail 6 Drain.
VCD	Monitoring station for Vail Cut-Off Drain.
TRD12	Monitoring station for Trifolium 12 Drain.
TRD13	Monitoring station for Trifolium 13 Drain.
TRD14A	Monitoring station for Trifolium 14A Drain.
TRD1	Monitoring station for Trifolium 1 Drain.
TRSD	Monitoring station Trifolium Storm Drain.
TRD18	Monitoring station for Trifolium 18 Drain.
POED	Monitoring station for Poe Drain.
TRD19	Monitoring station for Trifolium 19 Drain.
TRD20	Monitoring station for Trifolium 20 Drain.
TRD22	Monitoring station for Trifolium 22 Drain.
TRD23	Monitoring station for Trifolium 23 Drain.

For all the sampling stations, there are three (3) sampling points (S1, S2, S3) distributed along the cross-sectional area of the Drain. The sampling points are to be spaced at approximately equal intervals from each other and from the edge of the drain (i.e., at a distance equal to w/4, where "w" is the top width of the cross-sectional area). Figure No. 1, below, illustrates this.

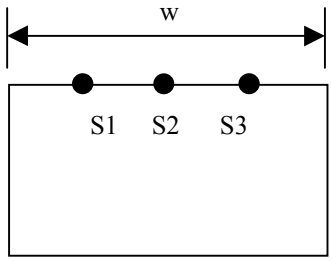


Figure 1: Sampling Points at Monitoring Stations

For the locations listed in Table 2, where the width of the drain is less than four feet and composite duplicates are required, the samples will be taken at the center point (S2) and composited into a single sample. A churn splitter will be used to make the duplicates. Where the width of the drain is greater than four feet, the samples will be taken at the three sampling points (S1, S2, S3) and composited into a single sample. A churn splitter will be used to make the duplicates.

For all sampling stations, readings of EC, DO, pH and temperature will be recorded at the center sampling point (S2) using the YSI 6600 sonde.

2.2 SAMPLING METHODS REQUIREMENTS

Sampling methods include the collection of grab samples, as well as the acquisition of readings for water quality parameters from the YSI water quality sonde.

Wherever possible, samples will be collected at the drop structure closest to the outlet of the drain where the water is thoroughly mixed. Otherwise the grab samples will be collected at approximately ½ foot below the water surface at the center sampling point (S2). Where hazardous conditions prevent midstream sampling, the grab sample will be collected at sampling location S1 or S3 and will be recorded in the field notebook. Grab samples will be collected using a swing sampler. For each sample collected, the sample bottle will be rinsed three times with native water before collection of the sample. The sample will then be placed into an ice chest packed with ice.

The YSI 6600 multi-parameter water quality sonde will be used to collect field measurements for the following parameters: DO, pH, temperature, and specific conductance (electrical conductivity) at the center point at each sampling location from about 1 foot below the water surface. When the readings have come to equilibrium, the values for these parameters will be manually recorded in the field notebook.

2.3 SAMPLE HANDLING AND CUSTODY REQUIREMENTS

In general, sample-holding times will be adhered to, as prescribed by USEPA and 40 CFR 136. Specifically, the required preservation techniques and holding times for all of the constituents which the laboratory will be analyzing are listed in Table 3, below.

Table 3 : Required Containers, Preservatives, Techniques, and Holding Times

Constituent	Container	Preservation Technique	Holding Time
Turbidity	1-quart low density polyethylene bottle	Cool 4 ^{0}C	48 hours
Total Suspended Solids			7 days

Each sample container will be labeled with a unique sample identification code. All samples (including QC samples) for laboratory analyses will immediately be stored in an ice chest, and will remain in the custody of field samplers until the samples are delivered to the laboratory. The ice chest will contain sufficient ice to maintain the samples at a temperature below 4°C at all times until they are relinquished to the lab staff. All samples will be delivered with chain of custody forms. A sample chain of custody form to be used for this project is included in Attachment 2. Any violation of holding times or other sample handling and custody requirements will be documented in the quality control records and reported to the Project Manager and the Quality Assurance Officer. Any violations thereof will be taken into account when evaluating the data.

2.4 ANALYTICAL METHODS REQUIREMENTS

As prescribed by the State Water Resources Control Board's "*Quality Assurance Program Plan*", each analytical laboratory used for sample analysis must have a written Quality Assurance Laboratory Manual describing the analytical method requirements. Water samples will be analyzed at the lab for TSS and turbidity, using USEPA approved methods as outlined in Table No. 4.

Table 4: Sampling Constituents and Methods

Constituent	USEPA Method	Reporting Limit	Units	Type of Sample
Turbidity	180.1	0.05	NTU	Depth-integrated, grab
Total Suspended Solids	160.2	4	mg/L	Depth-integrated, grab

2.5 QUALITY CONTROL REQUIREMENTS

In order to assess whether the data quality requirements of this project are being met, a number of quality control checks will be implemented. It is proposed that approximately 10 percent of all the samples analyzed be quality control (QC) samples. The calibration and maintenance of laboratory instruments and the general operation of the laboratories are subject to the requirements of the State Board Quality Assurance Program Plan and the Regional Board Quality Assurance Program for its Laboratory. All QC samples will be placed in an ice chest, and kept at 4 ^{o}C, for transport to the lab. Specifically:

- The Field Lead Person will prepare field duplicate samples during the sampling event. The field duplicate samples will be prepared from a grab sample of the water being sampled. A grab sample will be collected as described in the section above and placed in a churn splitter where the duplicates will be made by keeping the sample water constantly mixed.

- One pair of field duplicate samples will be prepared for each day of sampling.

- Two double blind spike samples for turbidity and TSS will be prepared by an independent lab and submitted to the laboratory for analyses.

QC samples will be submitted to the lab along with the "real" surface water samples being submitted as blind spike samples. (i.e., the laboratory will not be informed in any way as to which samples are control samples and which samples are from the Drains).

Table 5: Quality Control Sample Requirements

Quality Control Samples	Number Of Samples/Event
Duplicate Samples (10%/Event, 2 for each parameter)	2
Field Blanks (1/day/event)	1
Spike Samples (10%/Event)	2

2.6 INSTRUMENT/EQUIPMENT TESTING, INSPECTION, & MAINTENANCE REQUIREMENTS

All staff participating in the Project will be trained in the operation, calibration, and maintenance of the field instruments. The manufacturer's instruction manuals will be readily available for field personnel. The instruments will be maintained and calibrated in accordance with the manufacturer's instructions and recommendations. Prior to the collection of each sample, all equipment that comes into contact with the sample will be rinsed with distilled water.

2.7 INSTRUMENT CALIBRATION AND FREQUENCY

The YSI 6600 sonde will be calibrated in the laboratory prior to its initial deployment. It will then be tested in the field with known concentrations of pH, turbidity, and specific conductance. If necessary, the sonde will then be re-calibrated. The DO probe will be tested using tap water. Results of calibration measurements will be documented in the field log notebook and submitted to the Quality Assurance Officer. Table 6, below illustrates the YSI 6600 sonde specifications:

Table 6: Parameter Specifications for the YSI 6600 Multiprobe Sonde.

Parameter	Operating Range	Accuracy	Resolution	Calibration Standard
pH	0 to 14 units	± 0.2 units	0.01 units	3-pt, with pH buffered solutions
Temperature	– 5 to 50 ^{o}C	± 0.15 ^{o}C	0.01 ^{o}C	not required
DO	0 to 20 mg/L	± 0.2 mg/L	0.01 mg/L	saturated air
EC	0 to 100 mS/cm	± 1% of range	4 digits	KCl

2.8 INSPECTION/ACCEPTANCE REQUIREMENTS FOR SUPPLIES/CONSUMABLES

The Field Lead Person will ensure that sample bottles have no defects and have been prepared properly.

2.9 DATA ACQUISITION REQUIREMENTS (NON-DIRECT METHODS)

Only data collected from this project, historic data from the Board's Trend Monitoring Program, USGS water quality data, US Bureau of Reclamation data, and data from IID's DWQIP, which have already been approved, will be used.

2.10 DATA MANAGEMENT

Documentation and records will be kept as described in section 1.8 of this QAPP.

2.10.1 DATA STATISTICAL ANALYSIS

The Project Manager will prepare a Preliminary Monthly Data Report and submit a copy of the report to the Project Quality Assurance Officer within 7 to 10 days that the Project Manager has received all lab results for a sampling event. This report will summarize the field activities and observations; it will also include field measurements and the results of the laboratory analysis. This report will also include a quantitative analysis and discussion of the results of quality control activities, and what these results indicate about the quality of data generated in each sampling event.

The Project Manager will manage and analyze TSS and turbidity data using the Spreadsheet Excel software. Data will be entered into Excel in columns by drain and in rows by month. Descriptive Statistics (e.g. means, standard deviations, and coefficient of variation) will be computed for each column in part to ascertain the TSS loading of the drains and overall data trends. QC data will also be reviewed and entered into the spreadsheet by the Project Manager. As requested by the TMDL Development Unit Chief, the Project Manager will share data management records (e.g., spreadsheets) for TMDL development. Field data collected by sonde will also be analyzed using the Excel software. Data will be entered into Excel in columns by drain and in rows by month for each parameter collected. Descriptive Statistics (e.g. means, standard deviations, and coefficient of variation) will be computed for each column in part to ascertain the TSS loading of the drains. The results of the analysis of this data will be used qualitatively to address any discrepancies found in the lab data results (i.e. low D.O. reading may be an indicator of dredging not observed resulting in extreme TSS value). Before conducting any further statistical analyses, field and lab analyses data will be checked for potential outliers because outliers can greatly influence the statistical analyses of the data. As a means of identifying potential outliers a tolerance limit of three standard deviations (99 percent confidence interval) will be used. The following steps will be followed for thoroughly examining and dealing with outliers:

1. Conduct Outlier Statistical Test for the suspected outliers in each column as follows:

    a. Calculate the mean, the standard deviation and the coefficient of variance of the data.

    b. Calculate the statistical mean $\pm$ 2.58σ to determine any suspected values.

2. Check the field and laboratory records or daily logbook for any recording errors and to see if the samplers or the lab technicians noted any special observations or remarks regarding sample collection, handling, and lab analyses to explain the outlier.

3. For outliers whose causes of extreme values can be determined, the suspected data will be either excluded or corrected. Otherwise, the suspected data will be retained and included in the statistical analyses as a true but extreme value.

4. All the facts regarding deleting or retaining outliers should be documented in the statistical section of the final Project Report.

Statistical analyses methods such as the Dixon Type test or Chauvenet's Criterion will be conducted. The results of the analysis will be used to determine if extreme deviates are can be treated as outliers. In the case that the analysis shows that the data are not normally distributed other statistical methods of analysis will be used to normalize.

Upon completion of the last sampling event, the spreadsheet data and all data related to the sampling events will be transferred to the TMDL Development Unit for completion of the TMDLs.

3. ASSESSMENT AND OVERSIGHT

3.1 ASSESSMENT AND RESPONSE ACTIONS

Surveillance of the records and overall status of the project will be conducted by the Quality Assurance Officer to ensure that all of the requirements of the QAPP are being met. Surveillance will be conducted after each sampling event and after all laboratory results have been received for that sampling event.

A Technical Systems Audit will also be performed by the Quality Assurance Officer. During this audit, the Quality Assurance Officer will examine field activities and record-keeping procedures to assess their conformance to the QAPP. This audit will take place during the first sampling trip and any time thereafter. Any non-conformance with the QAPP will be corrected and documented. Performance Evaluations of the laboratories will be conducted through the use of quality control samples, namely split samples and matrix spike samples. A review of the laboratory's Quality Assurance for this project will also be conducted.

Prior to the submittal of the final report, an Audit of Data Quality will be performed to assess the handling of all data and to correct any errors found in the project database. A Data Quality Assessment will also be performed in which statistical tools will be used to determine whether the data met all of the assumptions that the Data Quality Objectives and data collection design were developed under, and whether the total error in the data is tolerable.

3.2 REPORTS TO MANAGEMENT

Upon completion of the project, the Project Manager will prepare a final project report. This final report will include a summary of the activities performed, the resulting data, and the quality of the resulting data, any problems encountered and their solutions and will identify any samples that indicate violations of Water Quality Standards.

4. DATA VALIDATION AND USABILITY

4.1 DATA REVIEW, VERIFICATION AND VALIDATION

Regional Board staff will be responsible for validating the project's data to ensure that QA guidelines have been followed.

4.1.1 DATA REVIEW, VERIFICATION, AND VALIDATION

After each sampling event, the Regional Board's Quality Assurance Officer will review the field notes and field data generated to assess adherence to the project sampling design in terms of the spatial distribution the sampling locations. Departures from the sampling design will be considered in the design of each subsequent phase of sampling. Deviations from the sampling design may change the data needed to characterize the system. Departures from the sampling design may also be due to unforeseen field conditions, which may require adjustment of the sampling design. Significant departures from the project sampling design and responses to those departures will be noted in the project database, as well as the Audit of Data Quality, and in the final report. In the Data Quality Assessment, the Project Quality Assurance Manager will consider the effects of any departures from the sampling design on the overall completeness of the data generated, and thus the usability of the data set for drawing conclusions.

4.1.2 VERIFICATION AND VALIDATION METHODS

Verification of adherence to the sample collection and equipment decontamination procedures contained in Section 5.3.2 of this report will be determined through the field records, Technical Systems Audit, and project surveillance identified above. All of this information will be considered in the final Audit of Data Quality. Departures from the sample collection and equipment decontamination procedures are unacceptable, and will result in data that will not be considered valid for use in this study. Unacceptable departures from sample collection procedures include the use of contaminated sampling bottles, the lack of critical sample collection information, or any other activity which would result in the cross contamination or incorrect identification of samples.

Departures from the sample handling and custody procedures contained in Section 2.3 of this report will be determined through the review of chain of custody forms and laboratory analysis forms. In order for data to be considered valid for meeting the data quality objectives of this study, all samples' chain of custody forms must be in the possession of the project manager, and strict adherence to holding times and temperatures must be followed. Data generated from samples that do not meet these requirements will not be considered valid for use in this study.

Verification of proper calibration of the YSI sonde will be performed during the audit of data quality through a review of the quality control records. Calibration values will also be assessed to determine the potential error in the field measurements. If calibration values for a particular calibration have errors that exceed acceptable error tolerances, the measurements obtained prior to that calibration, but after the previous calibration will be labeled suspect and further investigated to determine if they are valid for use in this study.

Validation of laboratory data will be performed in the Audit of Data Quality by assessing the results of QC sample analyses. Lab data will be validated for precision, accuracy, and completeness according to the criteria specified in Section 1.6

The data then will be entered into database by staff. It is conceivable, however, that errors could occur in entering the data (e.g., transposing the decimal point for a particular result or keying in the wrong Sample

ID). Therefore, once a data set has been entered into the database, all records will be checked to ensure accuracy.

In case of missing data, the staff will discuss it with the laboratories submitting the data. In some cases, missing data will be denoted as missing in reports. For all missing data, and any other data requiring special explanation, qualifiers will be included in the database and in data reports. Missing data will be designated as ”NR”, meaning *Not Reported*.

4.1.3 RECONCILIATION WITH USER REQUIREMENTS

The Quality Assurance Manager will be responsible for validation and final approval of all data for use in this study. The final project report will contain a discussion of relevant information obtained through the Audit of Data Quality about the quality, validity, completeness and limitations of the data obtained in this study. The final project report will also contain a discussion of the results of statistical analyses performed on the data set in the Data Quality Assessment, and a final conclusion as to the adequacy of the data set for making a final determination of the impacts of TSS in the study area.

Data objectives for this project do not require a full, formal, and independent data validation. Although the data is considered legally defensible as presented herein, all records will be available for independent evaluation should the need arise at a later date.

5. HEALTH AND SAFETY PLAN

5.1 CONTAMINATION CONTAINMENT ZONES

The contaminated areas for this Project consist of and cover the entire waterways for the aforementioned waters, their banks, and the area within 2 feet of the banks. Decontamination zones will be set at least 10 feet away from the banks of the surface waters. The decontamination zone will be used for personnel decontamination and will include wash water, soap, paper towels, and trash bags. All contaminated solid waste material will be placed in trash bags for proper disposal. Only biodegradable antibacterial soap will be used at the site. Wash water runoff will be contained and disposed of in the surface waters. The Clean area will be set at least 20 feet away from the banks of the surface waters.

5.2 PERSONAL PROTECTIVE EQUIPMENT

The general concerns at the sampling sites are the potential exposure to pathogens and toxicants present in the waters being sampled, the risk of being struck by an automobile when taking samples near the roadside or off of bridges, and the risks of sunburn, excessive heat exposure, insect and possibly snake bites. In addition, the sampling crew should be aware of the risk of falling into a drain. No less than three experienced samplers will be out in the field at one time. (The sampling crew will also have a functional cellular phone in one of the vehicles).

- Any member of the sampling team has the authority to stop the sampling event when he/she determines that conditions at the site (e.g., rain, dust, local emergency, etc.) preclude safe sampling. A Hazard Evaluation Plan (HEP) will be done for each day of sampling.

- To reduce the risk of exposure to pathogens and toxicants, all samplers will wear a Face Shield, Latex Examination Gloves (inner gloves), Nitrile Gloves (outer gloves), Tyvek Suit or isolation gown, and boot covers (required for collection of all samples). The Contaminated Zone must not be entered without the aforementioned PPE.

- The following precautions will be taken to reduce the risk of being around automobile traffic. At roads, bridge crossing, and wherever traffic is reasonably expected to be present, Traffic Cones will be set at approximately 30-foot intervals as to form at least a 5-foot wide “safety corridor” between the traffic and the sampling crew. At the beginning and end of the corridor, one State vehicle must be parked as part of the “safety corridor”. The parked vehicle and safety cones must be clearly visible to on-coming traffic from a distance of at least 120 feet. Samplers will also be required to wear orange vests when sampling near roads.

- To reduce the risk of heat exposure and sunburn, samplers will wear sunscreen and the vehicle will always have plenty of cold drinking water. If any of the samplers begin to experience symptoms of heat exhaustion, such as cramps or dizziness, he or she will immediately be removed from the sun and given plenty of cool liquids. If these symptoms persist, he or she will be taken to the nearest hospital.

- Extra caution should be used when working near or around the drains to reduce the risk of potentially falling in.

- To reduce the risk of insect bites, samplers will use insect repellent.

- To reduce the possibility of snakebites, samplers will check areas for snakes prior to entering the area. If a snakebite occurs, ice will be placed on the bite. The sampler will be immediately transported to the nearest medical facility.

5.3 PERSONNEL DECONTAMINATION PROCEDURES

The Clean Zone must not be entered with contaminated PPE. All team members coming out of the Contaminated Zones must immediately proceed to the Decontamination Zones and use the following decontamination procedures before proceeding to Clean Zone:

1. Remove boot covers and place them in a plastic bag;

2. Wash outer rubber gloves with antibacterial soap prior to removal of any other PPE. Place outer gloves in the storage bin labeled "Decontamination PPE No. 1";

3. Carefully remove Tyvek suit and place it in a plastic bag for contaminated articles to be discarded (making sure not to let skin contact the outside of the suit);

4. Remove face shield and place it in a plastic bag;

5. Remove latex gloves carefully to avoid contact with bare skin and dispose of them in the trash bag. Thoroughly wash hands with antibacterial soap; and

6. Dispose of wash water into surface water just sampled.

Note: everything that is touched (pens, pencils, rinse water bottles, probes, etc.) with dirty gloves could be contaminated. Avoid touching these items with bare skin.

5.3.1 EMERGENCY NUMBERS AND FACILITIES

All sampling personnel will have access to a cellular phone to call 911 in case of an emergency. The hospital nearest all sampling locations is Pioneers Memorial Hospital located at 207 West Legion, Brawley, telephone, 760- 351-3333.

In case of an emergency, sampling personnel should also contact the Regional Board Health & Safety Officer, as soon as practical at 760-346-6585 or 760-341-7491.

5.3.2 AFTER SAMPLING

Place samples into lab refrigerator or keep in an ice chest filled with wet ice; keep water drained from ice chests to avoid soaking container labels. Make copies of field notes and put original in the project binder. Contaminated equipment should be packed in designated containers for transport to the Regional Board office. Decontaminate and properly clean all items, which were exposed in the field in accordance with USGS National Field Manual for the Collection of Water-Quality Data, Chapter A3. Cleaning of Equipment for Water Sampling (See Attachment IV).

6. REFERENCES

Federal Interagency Sedimentation Project, 1976. *Sampling with Depth Integrating Sediment Samplers US DH-59 and DH-76*.

U.S. Environmental Protection Agency. 2001. *EPA Requirements for Quality Assurance Project Plans*, EPA QA/R5. EPA Publication number 240/B-01/003. U.S. Environmental Protection Agency, Washington, D.C.

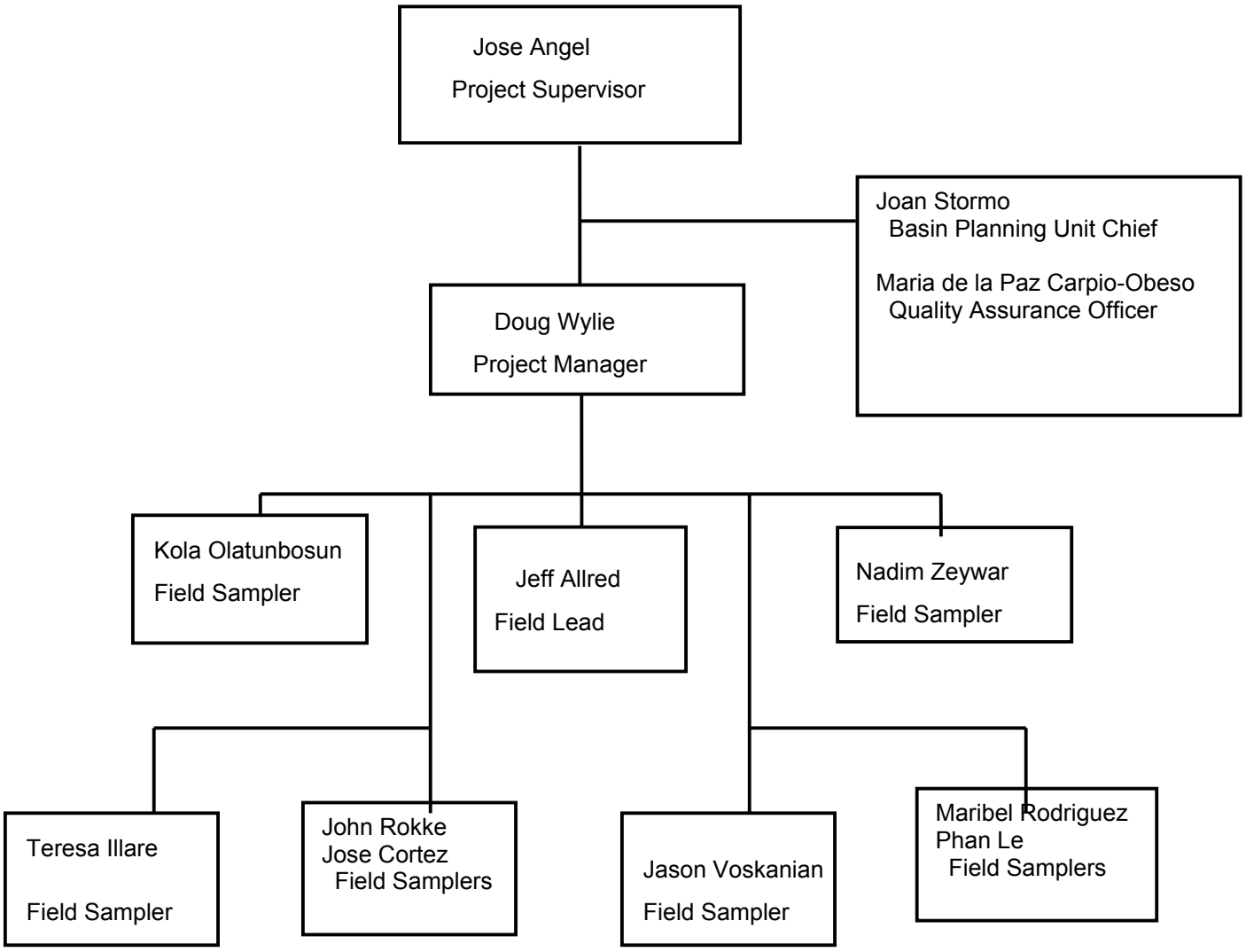
U.S. Environmental Protection Agency. Handling and Disposition of Project Records and Documents. SOP #EPA-90251.3b. U.S. Environmental Protection Agency, Washington, D.C.

U.S. Geological Survey, 1997. Field Guide For Collecting Samples For Analysis In Stream Water For The National Water-Quality Assessment Program, Open-File Report 97-401.

State Water Resources Control Board (State of California), 1994. *Quality Assurance Program Plan*.

Wilde, F.D., D.B. Radtke, Jacob Gibs, and R.T. Iwatsubo. 1998. National field Manual for the Collection of Water-Quality Data. Chapter A3. Cleaning of Equipment for Water Sampling. USGS, Reston, VA.

ATTACHMENT I, PROJECT ORGANIZATION CHART



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ATTACHMENT II, SAMPLE CHAIN OF CUSTODY FORM

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ATTACHMENT III, US FISH AND WILDLIFE INCIDENTAL TAKE PERMIT

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ATTACHMENT IV, DECONTAMINATION PROCEDURES

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ATTACHMENT V, LABORATORY STANDARD OPERATING PROCEDURES

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